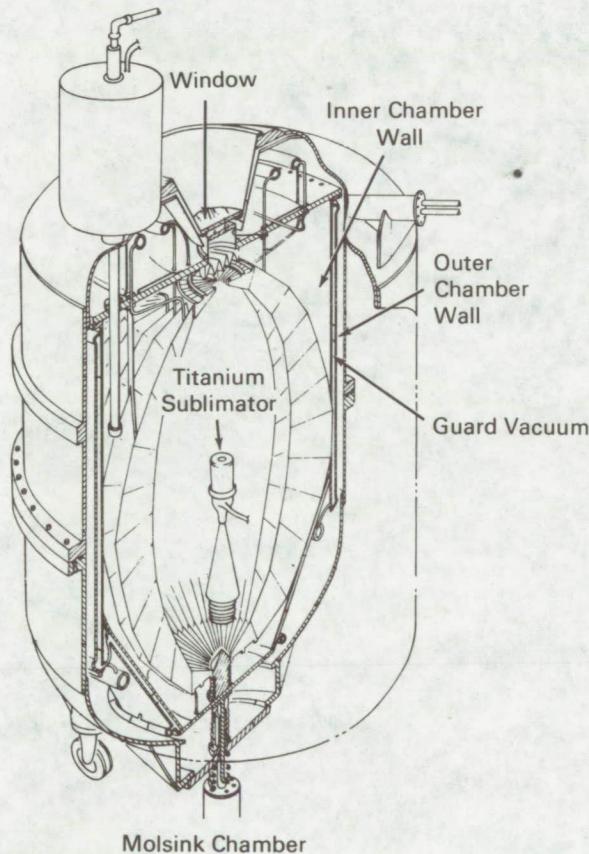


# NASA TECH BRIEF



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## Ultra-High Molecular Sink Vacuum Chamber



### The problem:

To maintain an ultra-high vacuum,  $10^{-12}$  torr, in a 10-ft vacuum chamber.

### The solution:

A vacuum chamber has been designed with a guard vacuum surrounding the ultra-high vacuum chamber. Although the technique of incorporating the double-

wall chamber design in high vacuum operation is well known, this chamber has a novel feature in that the vacuum test chamber can be separated from the remainder of the system and pumped by ultra-clean techniques.

### How it's done:

The theory upon which the chamber is constructed and by which the ultra-high vacuum is maintained in the test chamber is best explained by an example. If a leak in the outer chamber allows one million molecules of a gas to leak into the guard vacuum and if there is a leak in the inner chamber which would allow molecules of gas to leak into the inner chamber and then 999,999 of those molecules would be evacuated from the guard vacuum by the pumps which are not shown, the other one molecule would leak into the test chamber and be evacuated there by the moltrap wall or by the titanium sublimator. Because it is relatively easy to evacuate one molecule of gas rather than one million molecules of gas, the ultra-high vacuum may be maintained more easily in the test area by this procedure and by this construction.

A pictorial representation of the chamber, with its salient features, is shown in the figure. The chambers are separated by a space, the guard vacuum, normally maintained at about  $10^{-6}$  torr. The outer chamber is fabricated in two halves; the upper half contains a view port for observation during test operations.

The inner chamber is fabricated in the form of a cylinder which has a bulkhead plate bolted to the top. The wall of the inner chamber is jacketed so that liquid nitrogen may be circulated through it. The vacuum inside the test volume is maintained at  $10^{-13}$  torr by the moltrap wall which is cooled to  $10^{\circ}\text{K}$  and coated with titanium by the sublimation pump. The

(continued overleaf)

combined pumping action - the cryogenic effect of the cold wall and the titanium chemisorption - produce an ultra-high and ultra-clean vacuum.

**Note:**

No additional documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer  
NASA Pasadena Office  
4800 Oak Grove Drive  
Pasadena, California 91103  
Reference: B70-10130

**Patent status:**

No patent action is contemplated by NASA.

Source: J. B. Stephens and S. P. Yager of  
Caltech /JPL  
under contract to  
NASA Pasadena Office  
(NPO-10799)